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ABSTRACT

Presented are the rationale and description of the curriculum objectives developed for the Adaptive Beginning-School Learning Environment Program (ABLE). Included are brief discussions of: an analysis of the historical backgrounds and theoretical assumptions and approaches of extant preschool programs; the rationale for designing the ABLE program and how specifically ABLE differs from the extant preschool programs; the overall program goals; and the design for developing and implementing the program. The rationale and criterion objectives are explained for each of the eight ABLE curricular areas: attentional skills, memory skills, choice-contingency skills, social skills, perceptual skills, numerical and logical skills, communication skills, and independent learning skills. (Author/LS)

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THE RATIONALE AND DESIGN OF AN ADAPTIVE BEGINNING-SCHOOL LEARNING ENVIRONMENT: CURRICULUM OBJECTIVES

MARGARET C. WANG AND ALEXANDER W. SIEGEL

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Abstract

The rationale and description of the curriculum objectives developed for the Adaptive Beginning-School Learning Environment Program (ABLE) are presented. In addition, the paper includes brief discussions of: (1) an analysis of the historical backgrounds and theoretical assumptions and approaches of extant preschool programs; (2) the rationale for designing the ABLE program and how specifically the ABLE program differs from the extant preschool programs; (3) the overall program goals of the program; and (4) the design for developing and implementing the program.

Eight separate curricular areas are identified for the ABLE program. The curricular areas are: (1) attentional skills, (2) memory skills, (3) choice-contingency skills, (4) social skills, (5) perceptual skills, (6) numerical and logical skills, (7) communication skills, and (8) independent learning skills. The discussion of each curricular area includes the rationale and detailed description of the criterion objectives identified.

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THE RATIONALE AND DESIGN OF AN ADAPTIVE BEGINNING-SCHOOL LEARNING ENVIRONMENT: CURRICULUM OBJECTIVES

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I. Introduction

In this paper the authors discuss the rationale and describe in detail the curriculum objectives of an adaptive beginning-school learning environment designed for children of preprimary grades. The paper focuses on two questions: "Why are certain particular sets of objectives selected for inclusion in the proposed curriculum?" and "In what ways does the proposed program differ from other extant preschool programs?"

A. The Extant Preschool Programs

1. Background. In the past two decades, professional educators and the general public have been increasingly aware of the importance of growth and development that occurs during early childhood years. Although the concern for early childhood education spans many centuries--Rousseau (1762), Pestalozzi (1801), James (1890), and Baldwin (1906)--the current interest in early childhood education constitutes one of the most significant developments in education. This wave of interest in educational programs for young children is derived, in large part, from research findings and writings of developmental psychologists and professional educators.

They suggest that the preschool years are of great importance for intellectual as well as for socioemotional growth (Bloom, 1964; Deutsch, 1964; Erikson, 1963; Fowler, 1962; Hunt, 1961, 1964; Piaget, 1970; Werner, 1957). The wave gathered momentum in the mid-1960's with the involvement of the federal government's sponsorship of nationwide educational programs for disadvantaged young children.

The initial objective of the federal government and other agencies that funded nationwide programs such as Project Head Start was to alleviate the "harmful effects of poverty" by attempting to better prepare the disadvantaged child for entrance into the white middle-class school system. The programs assumed that poverty affected the child's learning abilities because of insufficient home training prior to beginning formal schooling. However, as compensatory educational programs for the disadvantaged preschool child were established, the recognition of early childhood as an important time to begin formal educational processes, not only for children from economically disadvantaged families but for all preschool children, began to spread. In fact, at the 1970 White House Conference on Children and Youth, the overwhelming majority of the delegates to the conference demanded that preschool and day-care programs of high quality be made available throughout the year for all who wanted it. Although the national goal in the 1960's of providing quality educational experiences for the disadvantaged preschool child remains a primary concern for educational developers in the 1970's, this goal has been broadened to include the improvement of education for all preschool children in the country.

2. Theoretical Assumptions and Approaches. In spite of the fact that assumptions about the importance of early experiences in the

cognitive and emotional development of the young child have gained almost universal acceptance, disagreement exists among child psychologists and preschool program developers concerning the content of the educational experience for the preschool child and the methodological approach to be taken in the intervention process. This disagreement is evidenced by the continued emergence of a great number of different educational models for preschool programs throughout the country. These programs differ in their theoretical viewpoint about the nature of what school learning should be, the nature of the preschool child's developmental processes, and the conception of the child as an active or passive organism. Therefore, even though the overall goals of the extant programs are generally quite similar, because of the difference in theoretical viewpoint the specific curriculum content and the particular pedagogical approaches to the implementation of their perspective programs tend to differ significantly.

In spite of the great differences that exist in educational theory, rhetoric, and approach, when programs developed in the 1960s are examined closely, particularly those well-known preschool programs funded by the federal government, they all share certain common assumptions (e.g., Bereiter & Engelmann, 1966; Nimnicht, 1969; Resnick, 1967; Weikart, 1967). These programs are essentially aimed at a target population of "disadvantaged" children and the focus is placed on better preparing the "disadvantaged" preschool child for later "school learning." The implicit or explicit assumptions of these programs are that: (1) Something is wrong or different about the children from the "disadvantaged" backgrounds; (2) a large gap exists between the "disadvantaged" children and their middle-class peers in school achievement; (3) this gap is probably caused by economical and cultural deprivations in some way--that is, something is lacking in the subcultural environment of children from disadvantaged backgrounds; and (4) current educational programs are

insensitive to these differences. Therefore, federally sponsored programs generally advocate that the way to "undo" these harmful effects is to provide appropriate compensatory intervention programs for disadvantaged children. In so doing, the instruction in the existing school programs may begin to adapt to the particular learning needs of the individual child.

Two theoretical positions seem to have exerted the most influence on the contemporary educational programs for young children--the reinforcement learning theory in the tradition of B. F. Skinner and the cognitive-developmental theory derived in part from Jean Piaget, and in part out of John Dewey's educational philosophy. While it is difficult to do justice to existing programs by attempting to categorize them according to certain theoretical orientations (e.g., Skinnerian or Piagetian), certain reasonably well-known preschool programs have been identified as belonging to (or have been identified with) one of the two relatively opposite general theoretical orientations (Denenberg, 1970, Glaser & Resnick, 1972; Hess & Bear, 1968; Lacrosse, Lee, Litman, Ogilvie, Stodolsky, & White, 1970; Maccoby & Zellner, 1970; Miller & Dyer, 1970; Parker, 1972). Examples of preschool programs associated with the reinforcement learning theory point of view are the Bushell Behavior Analysis Program (1970), and the program (DISTAR) developed by Bereiter and Engelmann (1966). Examples of programs associated with the cognitive-developmental point of view are the Perry School Project (Weikart, 1967), the Bank Street Program (Biber, 1970), the Responsive Environment Program (Nimnicht, 1969), and the Preschool Program of the Education Development Center (Armington, 1969).

The two dominant theoretical approaches can be characterized according to their fundamental assumptions about children and the nature

of development, and their approaches toward the educational process. It should be noted that the following descriptions represent the polar positions of the two theories, and that the preschool programs developed under either theory may or may not follow the extreme theoretical positions. In fact, most extant programs fall somewhere on the continuum between the two extreme points.

Common to all theoretical approaches to learning is the commitment to a psychology of stimuli and responses and to transactions with observable behavioral change (S. H. White, 1969). The following assumptions are held within this framework: (1) It is (ultimately) possible to unambiguously characterize the environment in terms of stimuli; (2) it is (ultimately) possible to characterize behavior in terms of responses; (3) reinforcers are an existing class of stimuli which, when applied contingently and immediately following a response, increase or decrease the response in a measurable way; (4) various possible couplings among stimuli, responses, and reinforcers characterize learning; (5) classes of behavior, unless there is definite and convincing evidence to the contrary, are assumed to be learned, manipulable by the environment, trainable, and extinguishable (S. H. White, 1970). The last three of these assumptions represent a conception of behavioral adaptation--the survival of the fittest response through reinforcement--which can be traced back to Thorndike and which, with variation, runs through all the learning theories.

Given these assumptions, programs developed within the context of the learning theory point of view are based on the belief that the education of young children consists of a process in which desired behavior is reinforced. Proponents of this point of view believe that the use of systematic reinforcement procedures "teaches" children competencies and

skills that they have identified as important for the young child to learn. The premise for this process is that positive steps can be taken to influence cognitive and socioemotional development of the child, and that children will learn the skills and acquire competencies when their educational experiences are directly and systematically planned to achieve this goal.

Although proponents of the learning theory approach recognize that it is important for children to want to learn (i.e., intrinsic motivation), it is believed that motivation is also a form of behavior and thus can be taught. One does not rely on the automatic process of intrinsic motivation, nor does one wait for it to develop spontaneously; if a child's experiences in learning are positive, then the reinforcement for learning is learning itself. The child is viewed as essentially a receptive and reactive organism (as opposed to an active organism). The preschool programs designed within the learning theory point of view are generally structural in their approach. The curriculum is carefully planned and sequenced to facilitate the acquisition of the program objectives. Emphasis is placed on the systematic monitoring of student progress in the program to keep track of children's development of skills, and to adapt instructional materials and strategies to the individual child's needs in order to maximize each child's potential. Thus, provisions for the diagnosing and monitoring of student learning progress in the program and the direct intervention in the child's learning experiences to achieve the program's goals are central to these programs (Maccoby & Zellner, 1970).

Programs developed within the cognitive-developmental framework hold to the belief that education is a process of facilitating or optimizing normal cognitive and emotional growth. Developers who follow this theory assume that cognitive and emotional growth develop in stagewise progression in the direction of increasing differentiation and

hierarchical integration. Cognitive-developmental theory suggests that this growth can be nurtured by providing the child with a wide range of experiences and stimulus material within the learning environment. Thus, the child gradually develops the competencies (s)he needs to control the physical and social environment. Learning and development are seen as interdependent processes.

The fundamental educational approach is to capitalize on the natural behaviors and natural motivations of the child engaged in classroom activities. The child, based on his/her developmental needs and interests, self-initiates and selects his/her own learning experiences and, to a certain extent, self-defines the educational goals. Therefore, the approach typically taken by programs developed from the cognitive-developmental approach is not to tell the child what to do; rather, it is to try to help the child do what (s)he wants and to extend what (s)he is capable of doing. Expressed within this context, the task of program development is to design and plan learning environments and experiences that utilize the present cognitive-developmental level and particular personal interests of individual children in order to extend their cognitive and social growth. The goal of education within the cognitive-developmental framework is to facilitate the child's learning and development rather than to directly intervene in these processes. In short, the basic assumption is that when the child fully explores and makes discoveries in the learning environment, the competencies required to cope with the natural and social world are developed.

Fundamental distinctions that exist among the preschool programs developed under these two theoretical positions can be summarized in terms of their "what" and "how" aspects. Basic differences in the "what" category are derived from the differences in the assumptions of

"what" the deficits in the development of the disadvantaged preschool child are. Programs developed under the learning theory approach are based on an assumption that certain school subject-matter oriented basic learning-to-learn skills are the key deficits (e.g., the Bereiter-Engelmann Preschool Program), while a basic assumption in the programs developed under the cognitive-developmental approach is that what the disadvantaged preschool child lacks are certain aspects of general affective and cognitive development (e.g., the Bank Street Preschool Program). Program differences in the "how" aspect are derived, for the most part, from interpretation of the role preschool education should play in the cognitive and social development of the preschool child. Programs developed under the learning theory approach tend to emphasize "active intervention" in making sure that the preschool child achieves mastery of all the objectives of the program. Alternatively, programs developed under the cognitive-developmental approach tend to emphasize the role of "facilitation" by providing opportunities for extending and broadening the preschool child's current level of cognitive and social development without direct intervention.

Preschool program developers generally recognize that it is important to develop a comprehensive program, one that is concerned with the child's cognitive as well as socioemotional development. (Indeed, for most extant preschool programs this is included in their stated program goals.) In actual practice, however, different programs tend to emphasize some stated goals more than others. This selective emphasis is reflected not only in their curriculum contents, but is also well documented in several studies designed to evaluate student outcomes of the different preschool programs (Stodolsky & Karlson, 1972; Weikart, 1973; S. H. White, Day, Freeman, Hautman, & Messenger, 1973).

According to our analysis, the stumbling blocks that prevent the achievement of the goal of developing truly comprehensive educational experiences by the extant preschool programs are primarily conflicts regarding theory and technology. The cause for the achievement of certain program goals and not others may well be the influence and/or limitations placed upon the program by the particular theoretical orientations of the program designers which, in turn, result in both differences in the interpretation of the kind of prerequisite skills and competencies the preschool child needs to acquire and develop, and practical limitations of instructional-learning resources and instructional technology (which include curriculum, the instructional-learning strategies, and diagnostic and evaluation techniques).

B. The Rationale for the Proposed Preschool Program

The fundamental differences between the proposed preschool program, the Adaptive Beginning-School Learning Environment Program (ABLE), and the extant programs lie in two basic premises. First, the authors rejected the general assumption (shared by most of the extant preschool programs) of "deficit" in the development of the culturally and economically "disadvantaged" preschool child. New evidence (Baratz & Baratz, 1970; Cole & Bruner, 1972; Ginsburg, 1972; and others) suggests that in many fundamental ways culturally and economically "disadvantaged" children's cognitive and social functioning is quite similar to that of middle-class children. Also, there are many universal characteristics of development (modes of language and thought) that are shared by all children regardless of socioeconomic or cultural differences. Furthermore, and perhaps more importantly, children differ as individuals. The individual differences within socioeconomic or cultural groups are as great, if not greater, than the differences that exist across these subgroups. Therefore,

by rejecting this particular "deficit" notion about culturally and socioeconomically disadvantaged children, and by focusing on individual differences in children, the ABLE program places its emphasis particularly on providing both learning environments that adapt to the learning needs of the individual student and opportunities for optimal cognitive and social growth for every preschool child.

Second, ABLE is designed with the assumption that no single theory can explain every facet of preschool child development. To effectively develop a program that is adaptive to children from varied backgrounds, one must first sort out the theoretical stumbling blocks and technological limitations of any given theoretical approach that may hinder the achievement of the program goals, and then actively seek ways to remove them. We have come to believe that one effective way to accomplish this is to adopt an integrative approach to theories about child development. Both the learning theory and the cognitive-developmental theory approaches have a great deal to offer to the development of educational programs for the preschool child. Furthermore, different developmental theories, although they may seem to conflict in their formulation about certain aspects of the developmental processes, can be adopted to the design of an effective educational program if the theoretical formulations and techniques developed under them are used in an integrated and complementary fashion, rather than in competing ways.

In designing the ABLE program, we have adopted an integrative approach. The approach is based on the theoretical position that there is a natural sequence of development with certain stagewise progressions in the various aspects of the child's development. However, since a certain amount of physical, socioemotional, and cognitive growth results from the interaction between the organism and the environment, it is

possible to actively intervene to facilitate, and even in some cases, alter the sequence of development. The assumptions that guided our work are derived from an integration of: (1) the cognitive-developmental and learning theories about the developmental processes of the preschool child; (2) the recent research findings in this area; and (3) our predictions of the kinds of competencies and behaviors that the preschool child needs in order to succeed in the present and future environments.

Specifically, from the cognitive-developmental approach we borrow the theoretical formulations about how young children function and how the functions change with development. We believe that the proper point to initiate the educational processes is to start where the child is functioning in the developmental sequence. Our main concern in this aspect is to adapt the educational experiences to the developmental needs of the individual child.

From the learning theory point of view, on the other hand, we borrow the theoretical notion that it is possible to accelerate certain aspects of the child's development by training certain abilities. In addition, from the learning theory we also borrow some of the approaches and techniques that have been established for the positive modification of children's learning--strategies used in the direct intervention and modification of certain developmental tasks. Particularly, we have included those techniques of manipulating environmental variables that support and reinforce the attainment of our program objectives, and techniques that are useful in helping us to specify those objectives. Our concern here is to influence the preschool child's functioning in order to maximize the development of the basic abilities of the individual child so that the child can profit from future learning environments.

C. The Overall Goals of the ABLE Program

The goals of the ABLE program are developed according to the basic assumption that preschool educational programs are valid to the extent that they can produce in the preschool child the skills needed to meet the school and extra-school demands placed upon the child in the present and the future--the "concurrent" and "predictive" validity of the program (in the context of "transferability" as proposed by Rohwer, 1971). Therefore, one of our central missions in designing the ABLE program is to identify processes and conditions that are conducive to the development of those "how-to-learn" skills that will increase learning proficiencies in the acquisition of new information and competencies.

Specifically, the goals of the ABLE program are to provide a variety of instructional alternatives and experiences that are adaptive to the learning needs and competencies of the individual child, and at the same time, to insure mastery of basic abilities that are required to function effectively in the child's present and future environments. Our vision of a competent child at age seven is a child with: (1) a repertoire of skills for accurately locating, efficiently learning, and adequately retaining new information; (2) a repertoire of skills for extending and transferring information to new situations for solving new problems; (3) motivational systems that will maximize the child's autonomous engagement in learning and problem solving situations; and (4) the ability to exert increasing control over the learning environment.

D. The Design

A program that places emphasis upon the acquisition of certain generalizable basic abilities, such as the ABLE program, requires a design that allows for interplay of analysis of relationships between the

identified program objectives and: (1) processes of cognitive and socioemotional development of the child; (2) developmental changes in cognitive and socioemotional functioning of the child; and (3) demands placed upon the child by the extra-school environment and later school learning.

The design we suggest for the development of the ABLE program includes the following major components: (1) the program objectives, for the identification and definition of competencies required of the preschooler to function effectively in psychological, natural, and social environments; (2) the curriculum, which includes the identification of the specific curriculum objectives and the development of curricular structures, the development of techniques and procedures for identifying and describing the cognitive-developmental levels and other learning characteristics of the individual child, the design of the physical environment, the development of intervention strategies and learning activities, and the development of instructional-learning management systems for the implementation of the program in school settings; (3) the teacher instructional roles for the specification of teacher behaviors required to implement the program; (4) the student learning roles for the specification of student learning behaviors under the instructional program; and (5) the formative and summative evaluation plans for empirical validation of the program.

The sequential steps for the development of each of the components outlined above are shown in Figure 1. We believe the interrelations and the interactions among the various components of the program (as indicated by the connecting lines and arrows in Figure 1) are features unique to the design of a learning environment that places its focus on the "adaptiveness" of the learning environment to the individual students. Detailed discussion of the rationale and the specification of each step included in Figure 1 appear in another paper by Wang (1974). One can recognize the

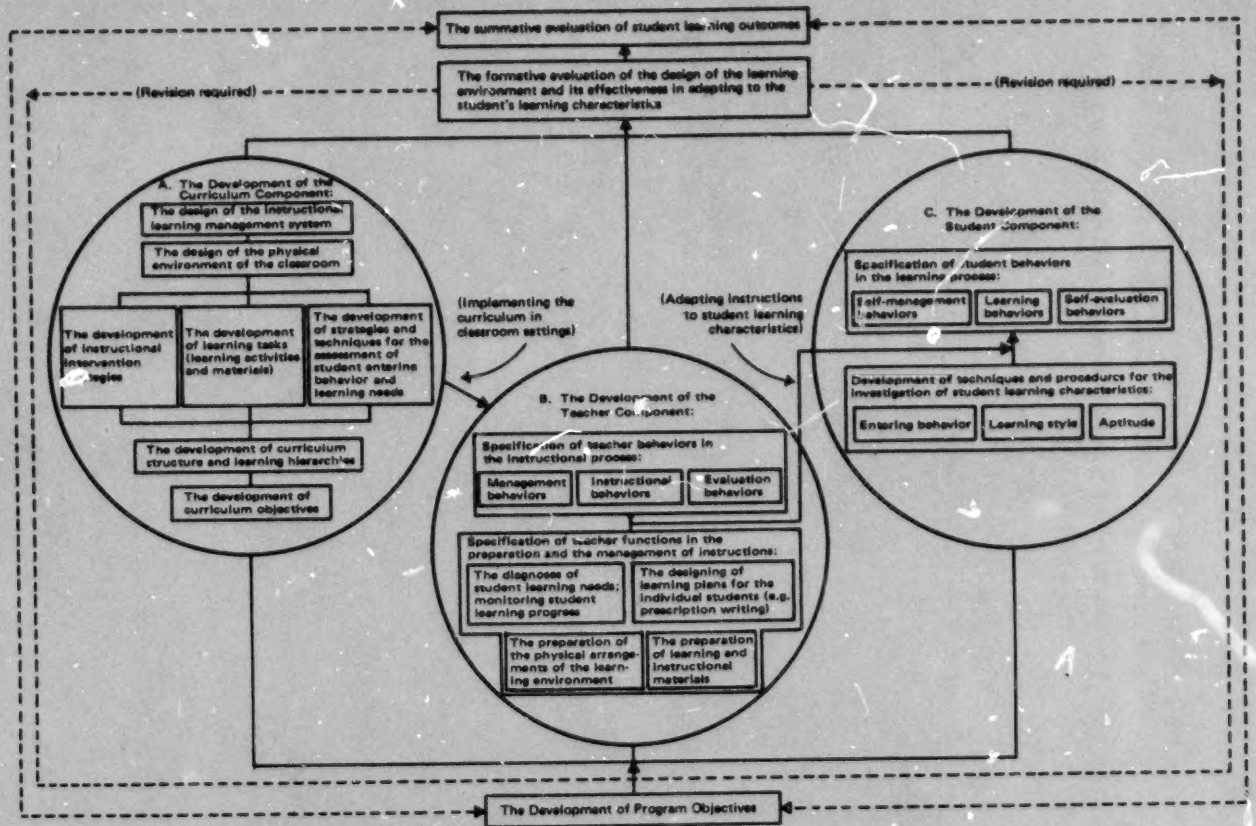
The summative evaluation of student learning outcomes
The formative evaluation of the design of the learning environment and its effectiveness in adapting to the student's learning characteristics
(Revision required)
(Revision required)
A. The Development of the Curriculum Component:
The design of the instructional learning management system
The design of the physical environment of the classroom
The development of instructional intervention strategies
The development of learning tasks (learning activities and materials)
The development of strategies and techniques for the assessment of student entering behavior and learning needs
The development of curriculum structure and learning hierarchies
The development of curriculum objectives
(Implementing the curriculum in classroom settings)
(Adapting instructions to student learning characteristics)
B. The Development of the Teacher Component:
Specification of teacher behaviors in the instructional process:
Management behaviors
Instructional behaviors
Evaluation behaviors
Specification of teacher functions in the preperation and the management of instructions:
The diagnoses of student learning needs; monitoring student learning progress
The designing of learning plans for the individual students (e.g. prescription writing)
The preparation of the physical arrangements of the learning environment
The preparation of learning and instructional materials
C. The Development of the Student Component:
Specification of student behaviors in the learning process:
Self-management behaviors
Learning behaviors
Self-evaluation behaviors
Development of techniques and procedures for the investigation of student learning characteristics:
Entering behavior
Learning style
Aptitude
The Development of Program Objectives

Figure 1. Sequential steps in the design and evaluation of an adaptive learning environment.

characteristics that are unique to our proposed design upon examining the specification of how each component is related to the other components and to the total design. We consider the identification of these functional relationships to be a key task in the development of an adaptive learning environment. In reading Figure 1, one should bear in mind that the developmental work proceeds from the bottom of the chart and up from left to right as indicated by the arrows. The present paper is only concerned with the discussion and the specification of curricular objectives--Step 1 of the curricular component shown in Figure 1.

II. The Development of the Curriculum Objectives

A. Approach

The competencies included in the curriculum for the ABLE program are selected on the basis of findings from theoretical and research literature (experimental and applied), and particularly on the basis of research findings from our past work (Resnick, Wang, & Rosner, in press; Siegel, 1974; Siegel & White, in press). However, the curriculum content represents not only an outgrowth of our previous work, but also a consolidation of knowledge and experiences beyond our own work (e.g., Bruner, 1966; Flavell, 1971; Kohlberg, 1968; Rohwer, 1971).

The specific criterion behaviors included in the following section are derived from detailed rationale analyses carried out by the authors. They are considered by the authors as critical skills to include in a preschool program that aims to develop in young children the effective use of knowledge and an increasing competency for knowledge acquisition.

It is our hypothesis that there is a relatively limited number of basic cognitive and social skills (manifested in a variety of specific tasks) that characterize the preschool child who can effectively meet the demands

of both school and extra-school environments. For example, these may include such generalizable skills as: (1) selective focused attention impervious to external distraction; (2) seeking, acquiring, and remembering information; (3) extending, transferring, and creating new information; (4) communicating information, thoughts, and feelings to oneself and to others, and comprehending such communications from others; (5) predicting future events; (6) understanding the structure and outcomes of choice situations; and (7) acquiring tactics and strategies for reaching chosen goals. Although the proposed program is largely concerned with developing "generalizable" skills, certain specific and nongeneralizable skills (e.g., color naming and numeral recognition) are included because they are basic skills that relate in some ways to the development of those "generalizable" skills we aim to develop.

In developing the curriculum of the ABLE program, we have leaned heavily upon the curriculum development work that has been carried out within the context of individualized instructional programs at the Learning Research and Development Center (LRDC) (Resnick, 1967; Resnick, Wang, & Kaplan, 1973; Rosner, 1972; Wang, 1973b, 1973c; Wang, Mazza, Leinhardt, & Millmore, 1971), as well as educational programs designed by others whose goals were to develop certain specific aspects of the preschool child's cognitive and social functioning (e.g., Blank & Solomon, 1968; Flavell, 1971; Montessori, 1964; Weikart, 1967).

B. Curricular Areas

Eight major curricular areas have been identified: (1) attentional skills, (2) memory skills, (3) choice-contingency skills, (4) social skills, (5) perceptual skills, (6) numerical and logical skills, (7) communication

skills, and (8) independent learning skills. The eight components, taken together, represent the hypothesized cognitive and social development of a competent child of approximately seven years of age. Each curricular area is discussed separately in the following sections. The discussion will focus on our rationale for selecting the particular curricular area for inclusion in the curriculum of the ABLE program, and descriptions of the specific competencies each of them aims to develop.

We would like to point out that although the curriculum includes eight separate curricular areas, we recognize that the skills covered in each area do not exist in the child's cognitive repertoire as psychologically isolated and unrelated abilities. Rather, the skills are considered as essentially interacting and unseparable elements with an underlying developmental synchrony. The descriptions of the separate curricular areas, nevertheless, serve to characterize the various kinds of basic abilities a competent seven-year-old utilizes when functioning in the school and extra-school environment.

1. Attentional Skills. The concept of attention has been the subject of discourse and study in psychology and education for over 70 years (James, 1890; Pestalozzi, 1801). Although James (1890) wrote that "everyone knows what attention is . . . ," not everyone means the same thing when they use the term. Attention has been given a variety of meanings, and as a conceptual process, attention has been utilized in diverse theoretical formulations to explain behavior of animals (Lawrence, 1963; Lovejoy, 1966), adults (Broadbent, 1958; Mackworth, 1968; Maltzman, 1967; Sokolov, 1963; Treisman, 1969), as well as children (Fellows, 1968; Jeffrey, 1968). One of the basic problems in dealing with the concept of attention and in coming to some general consensus on its meaning is that the term often refers to two types of phenomena: (1) observable orienting-

investigatory behavior (i.e., looking at or listening to), and (2) a cognitive intention or awareness on the part of the observed organism to "focus in" on (i.e., attend to) selective dimensions of the stimulus situation. Although the behavior and the intention world seem to go hand in hand, there is no one-to-one correlation between the two. The mere fact that a child is looking at an object (e.g., eyes focused upon and head oriented toward the object) does not guarantee that the child is cognitively attending to the object. The child may be attending (i.e., orienting), but not necessarily "paying" attention. Every teacher of young children has had the experience of a child attending to instructions, but not "listening" to them. The theoretical implications of these distinctions for a general theory of attention and its role in the learning process are dealt with in some detail in a paper by Fowler and Siegel (1971).

The attentional component is concerned with two general categories of abilities: (1) the ability to attend selectively, and (2) the ability to inhibit attention to irrelevant stimulus (impervious to distraction). Selective attention implies an inhibitory process. Jeffrey (1968) has argued that responding to abstract properties of the environment typically requires that one limits one's response to the most perceptually salient cue. Inhibition not only goes hand in hand with learning set formation (Harlow, 1958; Levinson & Reese, 1967), but also becomes part of being able to understand and accept the "E's rules for the game" (S. H. White, 1970). Jeffrey (1968) has also argued that abstract concepts require an active rather than a passive process of cue elimination. The importance of the ability to inhibit attention is apparent in the research on a variety of learning situations: incidental learning (Siegel & Corsini, 1969; Siegel & Stevenson, 1966), discrimination learning (Carson, 1969), and dimensional shift problems (Kendler, Kendler, & Ward, 1972).

Focused or selective attention to a dimension of a stimulus situation implies both attention to one aspect of the situation and simultaneous inhibition of attention to other aspects of the situation. These processes are basic to many of the behaviors included in other components of our program. In fact, attentional skills are embedded in many of the skills included in the logical skills component. For example, while working on a logical operation task, the child must not only focus attention on the dimensions relevant to the task at hand, but must also be relatively impervious to distraction. A child sorting objects by color must ignore (or inhibit attention to) shape or other irrelevant stimulus dimensions, and at the same time, of course, must pay attention to the sorting task without being distracted by other activities.

Specific objectives identified for inclusion in the attentional skills area are:

a. The ability to attend selectively to the relevant details and dimensions of a problem or stimulus array.

b. The ability to shift attention (e.g., in Piagetian terms, to "decentrate") from one dimension of a stimulus situation to another.

c. The ability to inhibit attention in a variety of contexts:

   (1) Distraction in another sensory modality (extramodal noise).

   (2) Irrelevant dimension in the same sensory modality (noisy dimension).

   (3) Irrelevant details on a particular dimension (noisy instances).

2. Memory Skills. The area of human memory is perhaps the most active area of research within contemporary cognitive psychology.

This is attested to by the myriad of recently published books devoted entirely to theories of the structure of memory (Melton & Martin, 1972; Norman, 1970; Tulving & Donaldson, 1972), as well as by the fact that large sections of introductory psychology textbooks are devoted to the topic (e.g., Bourne, Ekstrand, & Dominowski, 1971; Hilgard, Atkinson, & Atkinson, 1971; Lindsay & Norman, 1970). Work in the development of memory has ranged from the Piagetian viewpoint (Piaget & Inhelder, 1971) to the strict behaviorist viewpoint (Staats, 1971) to the cognitive-developmental point of view (Flavell, 1971; Hagen, 1971). There is a growing consensus (Flavell, 1971) that memory is largely applied cognition. That is, what we call memory processes are primarily familiar cognitive processes as they are applied to a particular class of problems.

Piaget (1968) has argued that: "In a word, memory seems to be a special case of intelligent activity, applied to the reconstruction of the past rather than to knowledge of the present or anticipation of the future" (pp. 15-16). A brief look at current research reinforces this point of view. Haith (1971) has shown that the young child is deficient in strategies for coping with simultaneously presented information and suggests that this deficiency may be characteristic of the child's performance over a wide range of cognitive problems. Corsini (1971) has argued that:

> Perhaps the most important thing with memory development is in the development of its operational system. Every representational act performed by the organism is an interaction between the environmental stimulus complex and the presently existing cognitive structure and content of the organism. (p. 233)

He makes the point that what a child does in a given memory task depends on the nature of the particular task, the child's previous experiences with memory tasks, and on that child's level of cognitive competence.

Hagen (1971) presents compelling evidence that indicates "... that in the course of development children begin to engage actively in certain strategies which are aimed at facilitating recall. The issue of intention or purpose is certainly implied by this account" (p. 267). Hagen also suggests that memory development may proceed at two levels. On one level, the child acquires skills and abilities that can eventually subserve mnemonic ends; on another level, the child develops an awareness of self as an active, deliberate storer and retriever of information.

Teaching memory skills to young children has not been explicitly included in extant preschool programs. In fact, most extant programs do not pay much attention to how children go about trying to study and retain information they are supposed to learn, much less to how they might be taught to do so more effectively. The memory skills component (of the proposed curriculum) is concerned with the development of recognition skills, recall skills, and skills in the use of certain strategies for encoding and retrieval.

Specifically, the memory skills aim to develop three classes of ability:

a. The child's ability to recognize:
   (1) That a given object (both singly and from an array) has previously been seen or felt.
   (2) That a given word or label (both singly and from an array) has been previously heard.
   (3) That (s)he has previously been in a specific environment (e.g., the grocery store, or a street in his/her neighborhood.
   (4) That (s)he has previously been in a specific situation or set of circumstances (e.g., a cooperative

or competitive game).

(5) Settings in which specific labels, relations, concepts, strategies, rules, etc., have been previously used.

b. The child's ability to recall (whereas recognition skills require only a "yes-no" response, recall requires the retrieval of specific item-related information):

(1) Objects in the classroom, home, and other familiar (or novel) environments.

(2) The spatial organization of the classroom, home, neighborhood, and other familiar (or novel) environments.

(3) Task instructions.

(4) The attributes, relations, concepts, strategies, and rules that characterize a previously experienced setting.

(5) The temporal sequence and general theme of a series of events that (s)he has previously heard (e.g., a story) or experienced (e.g., what the child did yesterday).

(6) The spatial sequence of a series of pictures, words, numbers, or other visually presented items.

c. The child's ability to use and invent memory strategies. (This group of objectives is concerned with heuristics--whereas recognition and recall are concerned with retrieval of content, strategies are concerned with the manner in which the storage and retrieval of such content takes place):

(1) The ability to acquire strategies for facilitating the retention and retrieval of visually and auditorially presented information. These strategies include labeling (verbal mediation), associating, imaging, rehearsing, categorizing, and dimensionalizing.

(2) The ability to retain information by applying one or more appropriate memory strategies to that information (e.g., know which one to use).

3. Choice-Contingency Skills. The problem of choice is a central one for psychology. Indeed, Diamond, Balvin, and Diamond (1963) have defined psychology as ". . . the science of behavioral choice." Whereas the physiologist is concerned with the mechanism which enables an organism to effect a turn to the right, the psychologist is concerned with why an organism which is equally capable of turning to the left or the right chooses to turn right. Psychology begins with a review of the behavior of the total organism and asks the question, "Why does it behave sometimes this way, and sometimes that?" Behind that "sometimes" there may be a problem of learning, or instability, or individual idiosyncracy, etc. What is important is that the problem for investigation is not formulated in terms of different responses to different conditions, the question of whether this or that change in external conditions will produce different responses, but that it is formulated in terms of different responses which appear under the same conditions.

For an organism to exhibit choice it must be so constituted that it can perform at least two different responses under the same condition. Therefore, the existence of choice always implies the possibility of internal conflict. As organisms grow more complex the possibilities for choice become more numerous, and the choices are very often influenced by a residue of past experience (Berlyne, 1960). At the highest levels, the

choice may be based on imaginal effects between actions. However, all these possibilities are based on the mutually inhibitory relationship which exists between alternative responses to the same situation, which is the common element in all choice behavior from the simplest to the most complex. "You can't have your cake and eat it too" is an appropriate (albeit cliché) phrase to describe these choice situations. Basically, it is a zero-sum game. That is, when one chooses (wins) road X, he gives up (loses) road Y.

Lloyd Morgan (1891) saw inhibition as the basis for choice, or as he called it, "volition."

> I go so far as to say that without inhibition, volition, properly so called, has no existence. When the series follows the inevitable sequence: stimulus -- perception -- emotion -- fulfillment of action, the act is involuntary, and as such it must have remained had not inhibition been involved, had not an alternative been introduced, thus: stimulus -- perception -- emotion $\lessgtr$ fulfillment of action / inhibition of action. At the point of divergence, I would place volition. Volition is the faculty of the forked way. (p. 459)

Thus, Morgan seized upon inhibition as an explanation of choice. This is not a unique point of view, and is taken by a variety of other well-known individuals (Anstie, 1864; Harlow, 1958; Sokolov, 1963; S. H. White, 1965).

The experimental literature in children's learning, both social and otherwise, is replete with investigations of their performance in a variety of situations that one might call choice situations. Discrimination learning, reversal learning, instrumental learning, and the like are examples. Much of a child's behavior in a classroom (and in work outside the classroom) consists of being faced with (or facing oneself with) environmental situations which require the child to make a choice. In

order to behave adaptively in these situations, the child must have or acquire certain skills in and knowledge of choice situations. When one is constructing an adaptive learning environment, one must develop controlled situations that contain choice situations in which the knowledge of choice structure is incorporated, and one must be sensitive to those situations already existing in which choice is incorporated. This is a far preferable procedure than letting the "theoretical chips of choice" fall where they may.

Specifically, the choice-contingency skills include two types of competencies:

a. The ability to recognize and recall the structure of choice situations in which:
   (1) All situations contain choice.
   (2) Choices are sequential and dependent (i.e., later choices are not typically independent of earlier choices).
   (3) All choices require a decision (even though it may be a simple "go-no go" decision).
   (4) All choices have consequences (i.e., something will or will not happen depending on the child's choice response).
   (5) Even making no choice does involve a choice.

b. The ability to extract the choice-contingency structure in specific situations. The child must be able to:
   (1) Determine the particular choices available in a given situation.
   (2) Predict the specific consequences of a particular choice.

(3) Assess the relative payoff value of a particular consequence.

(4) Recognize that if a choice is not made, someone (or the situation) will probably make it for him/her.

4. Social Skills. Social development of the preschool child has been recognized as the main concern of preschool educators since the establishment of the first nursery schools in the 1920's in this country (Sears & Dowley, 1963). Social development is not only viewed important in its own light; it is also recognized as closely related to cognitive and socioemotional growth by theorists (Erikson, 1963; Piaget, 1963; as well as by practitioners (Gray, Klause, Miller, & Forrester, 1966; Jersild & Fite, 1939; O. K. Moore & Anderson, 1968; Smilansky, 1968). It is generally recognized that the different aspects of the child's development (i.e., cognitive and social) interact and deeply affect one another. Social skills along with other basic skills are considered essential to the development of the child's ability to adapt and actively control the environment. Theoretically, the social development of the young child can be viewed as the processes in which an egocentric being develops into an adaptive social being (Erikson, 1963; Piaget, 1963). The course of social development can be explained by theories of social learning as set forth by Bandura (1969) and the theory of social interaction proposed by Thibaut and Kelley (1959).

In the design of the social skills component, social development is viewed as a product of interaction between the individual and the environment. As the child develops sensitivity to the causal, consequential nature of the behavior, the effects associated with his/her behavior and the purpose and goals of the behavior, the child develops: (1) the ability to basically understand others; (2) the ability to comprehend and learn the rules and expectations imposed upon the child by the

environment; and (3) the competence to achieve mastery and control of the environment. Furthermore, the development of these social skills is considered prerequisite to the establishment of constructive and rewarding relationships with others (e.g., adults and peers), and successful functioning and adaption to the social environment in which the child lives.

Although social development has been identified as the most important goal of a preschool program by many preschool educators due to relative difficulties in defining the variables related to social development, the learning outcomes in this area are rarely documented. Consequently, the development of social skills has been largely left to the child to develop "naturally" without much active intervention. The social skills component of the ABLE program is, therefore, developed with the purpose of teaching certain social skills that are important to that aspect of development of the preschool child. However, we would like to stress that, in the following section, the discussion on the specification of the curriculum objectives for the social skills represents an early pilot attempt on our part. We view this as the beginning point for the development of a social skills curriculum and, furthermore, we recognize that of the eight components included in the proposed program, the social skills component seems to be the most crudely developed.

The skills included in this component deal specifically with the "process of socialization." The process of socialization is defined for our purpose as the way in which an individual learns to live in harmony with himself/herself and with others in a productive, satisfying, and giving way within the social environment of which the individual is a part. Two major categories of competencies have been identified: (1) the ability to understand oneself, and (2) the ability to relate to others. The positive outcomes of the development of the ability to acquire the understanding of

oneself would be the development of a positive self-image, self-confidence to form effective interaction with one's environment, and most importantly, the need (motivation) to interact with and be aware of others. The positive outcomes of the ability to relate to others would be the development of an awareness of others, the ability to establish positive interrelationships with others, and the confidence or feeling of efficacy (R. W. White, 1959) in achieving mastery and control of the environment.

The ability to understand oneself deals with awareness of one's own feelings, thoughts, and behaviors in relation to the cognitive and social structure of one's environment. It concerns the relationship between the child's own needs and goals and those of others, and the ability to comprehend and translate these relationships in terms of how the child perceives others as viewing himself/herself.

Skills related to the ability to relate to others are developed with the rationale that, "Socialization is a structuration to which the individual contributes as much as he receives from it, whence the interdependence and isomorphism of 'operation' and 'cooperation' " (Piaget, 1969, p. 156). The child needs to have self-awareness as well as awareness of others in order to function adaptively in a social environment. Research findings in this area indicate that the ability to relate to others in the social environment is positively correlated with complying to routines and "acceptance" of the situation (Koch, 1933), adjustment and cooperation with group rules (Lippitt, 1941), and peer perception of conformity (S. Moore, 1967).

The ability to relate to others includes the ability to comprehend and learn about other people's feelings, thoughts, needs, and behaviors as well as the ability to learn and comprehend the rules and expectations imposed upon a person by the particular social environment. One's self-concept consists, in part, of evaluation of the degree to which one's

attributes match those that the culture regards as positive. A sense of the degree to which one possesses "positive" attributes is determined largely from one's social experiences.

The child's ability to interrelate with others can be classified under three main categories of interactions: cooperative, interactive, and affiliative. The principle aim is to help the child move from self-centeredness to social interaction in order that he might become a socially competent person.

The specific objectives included under the ability to understand oneself are the abilities to perceive oneself as:

a. A person capable of coping with and controlling the environment.
   (1) The ability to set one's goals and be capable of achieving those goals.
   (2) The ability to acquire knowledge (in and out of school).
   (3) The ability to solve problems.
   (4) The ability to make decisions and choices.
   (5) The ability to deal with one's environment creatively and effectively.

b. A person who is capable of getting along with others.
   (1) The ability to communicate feelings, thoughts, needs, and opinions to others.
   (2) The ability to understand other people's feelings, thoughts, needs, and opinions.
   (3) The ability to identify with peers.
   (4) The ability to make contributions to one's peer group.

c. A person who identifies with his/her particular ethnic and cultural heritage.

Curriculum objectives for developing the ability to relate to others include:

a. The ability to cooperate with others (e.g., share materials and activities).

b. The ability to interact with others (e.g., tolerate and permit others to be different and do things differently--a give-and-take attitude).

c. The ability to affiliate with others (e.g., identify with group values--peers and ethnic culture).

5. Perceptual Skills. The ability to externally represent conceptions of reality along spatial dimensions underlies much of man's symbol-making activities (e.g., writing, musical scores, schematic diagrams for machines, blueprints, road maps, etc.). It is important to examine the development of this ability within an evolutionary framework to understand the ontogenetic development of representational skills. Fishbein (1974) has argued that man's ability to create and utilize cognitive maps--internal representations of the spatial and temporal environments in which he exists--was crucial to his success as a cooperative hunter of big game. The evolution of man's ability to create and utilize cognitive maps, along with the evolution of motor skills, led to an important evolutionary opportunity--the ability to create external representations that correspond to these cognitive maps.

The general goal for including the perceptual skills in our curriculum is to teach the preschool child the basic processes with which raw sensory data can be organized into meaningful structures, and to construct cognitive maps of the environment into which new data can be assimilated. Perceptual skills are viewed as abilities developed and determined by the interaction between the child's intact sensory systems and personal experiences. Furthermore, the development of perceptual

skills proceeds through a number of age-related stages (Piaget & Inhelder, 1956). Overlaying this genetically controlled process is cultural learning which varies from culture to culture (Cole, Gay, Glick, & Sharp, 1971; Olson, 1970). In western industrial societies, for example, children enter school between the ages of five and seven and start to receive instruction in a variety of subjects which involve spatial understanding (e.g., writing, drawing figures, copying, using maps, measuring with rulers, using musical notation, etc.). The most fundamental aspect of spatial understanding is that of the relationships between objects in the immediate environment. In order for a child to form cognitive maps of distant objects or of nonspatial events, the child must first have the ability to internally represent what is before him/her. A child's conception of space can be no more accurate than the perception of that space. For example, on tasks requiring the selection of one drawing from a group of drawings as a demonstration of spatial understanding, if the child does not accurately perceive the drawings, he/she cannot accurately indicate his/her understanding (Siegel & Schadler, 1973).

Two general principles are applicable when describing the ontogenesis of perceptual skills. First, all acquired sensory-motor functions proceed in congruence with the orthogenetic principle (Kaplan, 1967; Langer, 1969; Werner, 1957), that is, from global to differentiated (Espanschade & Eckert, 1967), and in the direction of increased hierarchical integration. Second, over a period of time a child's ability to analyze visual and acoustical data becomes less and less dependent on the haptic-kinesthetic supporting cues derived from these motor functions (Zaparozhets, 1965; Zinchenko, 1970). The curriculum objectives identified for the perceptual skills component are based upon these two principles and are organized into three subcategories: visual-motor,

auditory-motor, and general-motor skills. The specific rationale for the inclusion of these particular subcategories of skills in our program are, in general, based on the arguments presented by Rosner (1972) in designing the LRDC Perceptual Skills Curriculum.

The overall goal of the general-motor skills curriculum is to develop the preschool child's ability to infer organization on relatively undefined three-dimensional spaces. It has been argued by Rosner and others (Rosner, 1972; Gesell, Ilg, & Bullis, 1949) that people organize their visual space on an inferred map of coordinates representing the three dimensions of vertical, horizontal, and relative distance from self; and furthermore, three-dimensional spatial localizations are considered most difficult to perform in an undefined space containing no objects and without the presence of gravity (Howard & Templeton, 1966; Warren, 1970; Witkin, Dyk, Faterson, Goodenough, & Karp, 1962). As stated by Rosner:

> A well-defined space and the objects contained within it function as topological cues; the nodes from which the three-dimensional coordinates may be inferred. As the cues are removed, the viewer must infer these also; he must act as though they were present in the environment. (p. 24)

The visual-motor skills are concerned with the development of two-dimensional map construction skills. The general goal is to teach the preschool child to recognize similarities and differences in visual patterns, to analyze complex visual patterns into their component parts, and to recognize the spatial interrelationships of those parts. Rosner has argued convincingly that being able to recognize similarities and differences in visual patterns is by no means equivalent to knowing the construction of patterns well enough to produce them accurately; only when the child begins to acquire the capacity to see a finite number of lines

and understands the interrelationships of these elements, will the child be able to more closely approximate a replication of a given stimulus design (Rosner, 1972).

The general goal of the auditory-motor skills is to develop the child's ability to analyze spoken words into their structural parts, and to recognize the invariant temporal interrelationships of those parts. According to Rosner's analysis, the description of a competent visual perceiver also can be used to describe the competent auditory perceiver. He reasoned that although spoken phrases are composed of separate words and phonetic parts, they are generally spoken in a way that seems to blend together. For example, the sentence, "Train now leaving for Rochester" actually sounds as "Trainnowleavingforrochester" until the listener analyzes the phrase into discrete words (Rosner, 1972). Rosner also pointed out that acoustical events such as those that occur in speech ". . . do not have spatial attributes. . . . Phonic events occur along the dimension of time, not space" (p. 21), and thus, their attributes are temporal. It is only when speech is represented by visual symbols that a spatial dimension is required. He has further stated that:

> To provide some kind of map for plotting phonic events, one must have available a structure that orders time. One such structure is rhythm; rhythm is organized time. Indeed, one reason why we tend to recall songs and poetry more efficiently than we do prose, even when there is no rhyming, is because of the overt cues--the orderliness--provided by the rhythm of the presentation. When there is also rhyme, the task becomes even easier; the regular pattern of salient acoustical attributes provides additional overt cues for organizing the sensations into meaningful sub-assemblies. (p. 22)

Curriculum objectives included in the Perceptual Skills component are aimed to develop three categories of skills:

a. Visual-motor skills

(1) The ability to see (i.e., analyze) an object or geometric design as a finite number of elements by reproducing those same elements.

(2) The ability to see the interrelationships of these elements on a map of spatial coordinates by reproducing the interrelationships.

(3) The ability to impose spatial coordinates in a space where it does not visually exist by reproducing a pattern in an empty space.

b. Auditory-motor skills

(1) The ability to recognize spoken words as constructed of a series of phonic events occurring in a specific blended ordered sequence. This ability requires that the child be able to vocally analyze a word into its segments, and to vocally integrate phonic segments into words.

(2) The ability to recognize sentences as being constructed of an ordered series of words and phrases. This requires that the child be able to vocally analyze a sentence into its constructs, vocally integrate these constituents into a sentence, and repeat a sentence verbatim.

c. General-motor skills

(1) The ability to copy increasingly complex motor movement sequences from a model. This implies that the child be able to analyze a motor sequence into its components, integrate these components motorically and streamline these sequences into subroutines that are nearly automatic (e.g., throwing balls).

(2) The ability to see (i.e., analyze) the environment as a map of spatial coordinates (imposing a three-dimensional matrix), by reproducing a three-dimensional model (map) of the environment, with the model present or absent (e.g., model airplane building).

(3) The ability to predict the spatial coordinates for a position in the environment other than its current position (e.g., describe the spatial coordinates of the teacher's desk in the classroom from a hypothetical position outside of the classroom).

6. Numerical and Logical Skills. The important role numerical and logical skills play in the cognitive functioning of the young child has been demonstrated in the work of many cognitive and developmental psychologists; it is particularly stressed in Piaget's work. According to Piaget (1965):

> Construction of number goes hand in hand with the development of logic, and that a pre-numerical period corresponds to the pre-logical level. Our results do, in fact, show that number is organized, stage after stage, in close connection with the gradual elaboration of systems of inclusions (hierarchy of logical classes) and systems of asymmetrical relations (qualitative seriation). . . . In our view, logical and arithmetical operations therefore constitute a single system that is psychologically natural. (p. viii)

He further points out that:

> Number can be regarded as being necessary for the completion of truly logical structures. . . . Instead of deriving number from class, or the converse, or considering the two as radically independent, we can regard them as complementary, and as developing side by side, although directed toward different ends. (p. 161)

This notion of the interacting relationship between the development of numerical and logical operations is supported by theorists (e.g., Bruner, 1966), and by research findings of cognitive and developmental psychologists (e.g., Lovell, Mitchell, & Everett, 1962; Olmsted, Parks, & Rickel, 1970; Olver & Hornsby, 1966; Sigel & Hooper, 1968). Bruner (1960) talked explicitly to this point in his book on the process of education:

> It might be interesting to devote the first two years of school to a series of exercises in manipulating, classifying and ordering objects in ways that highlight basic operations of logical addition, multiplication, inclusion, serial ordering, and the like. For surely these logical operations are the basis of more specific operations and concepts of all mathematics. (p. 46)

The numerical and logical skills included in our curriculum have this theoretical derivation from Piaget's formulation on the young child's development of number concepts and logic. These skills are considered as learning-to-learn tools (i.e., process tools) with which the young child can order, classify, and conceptualize the logical structure of the environment. According to Piaget, there is an invariant sequence of cognitive development, and each stage in the development is characterized by the presence or absence of specific cognitive operations. Theoretically, each individual moves through this sequence at varying rates; however, the specific operations within each stage must be acquired before one can reach the next stage of development (Flavell, 1963; Wholwill, 1960), and training does not lead to mastery of specific operations (Flavell, 1963; Kohlberg, 1966). However, it is important to point out that although the content of our numerical and logical skills component is developed on the basis of Piaget's theory of cognitive development, our assumptions of how the operations can be developed are different from the original assumptions of Piagetian theory. We believe that it is possible, through

appropriate instructional interactions, to significantly accelerate or even alter the sequence of development. Recent research literature on this topic provides increasing evidence to support this position (Beilin, 1971; Brainerd & Allen, 1971; Caruso & Resnick, 1972; Flavell, 1971; Glaser & Resnick, 1972; Jacobs & Vandeventer, 1971, Parker, Rieff, & Sperr, 1971).

The numerical component is developed with the focus placed on the processes that reflect more directly the definition of the number concept and arithmetic operations. The concepts of number and arithmetic operations are presented as a body of knowledge which obeys well-defined principles or laws. At the heart of this basic premise of number concepts and arithmetic operations lies the concept of sets, relations, and numbers. Our goal is to present fundamental number concepts, or operations leading to them, in forms simple enough to be learned by every preschool child, yet broad enough to serve as a conceptual foundation for later mathematics learning. The core concept around which the numerical component is organized is "number" (Resnick, Wang, & Kaplan, 1973).

The logical skills component is concerned with the development of skills with which the young child can systematically organize and codify the environment (i.e., classification skills). As children learn to recognize and organize the various elements present in the environment, they learn to direct this behavior adaptively to those elements. Furthermore, as children learn to identify those critical and invariant features common to the objects or events in the environment, the logical skills that sharpen their thinking are also acquired. Skills included in the logical skills component are concerned with the child's abilities to discriminate and generalize as objects, events, and ideas are grouped on the basis of commonalities and differences. Basically, the logical skills component is concerned with the ability to form grouping on the basis of one or more common

attributes, and to exclude from the group on the basis of one or more dissimilar attributes (Wang, 1973c).

Specific curriculum objectives included in numerical and logical skills are:

a. Numerical skills

(1) The ability to count (includes rote counting, counting moveable and fixed arrays of objects, as well as counting out subsets).

(2) The ability to use numerals (includes reading numerals as well as matching numerals with sets of objects).

(3) The ability to make comparisons of set size.

(4) The ability to order and seriate sets according to size.

(5) The ability to make partitions and combinations of sets.

(6) The ability to carry out physical measurement operations (volume, area, size, and length).

(7) The ability to perform simple geometric transformations (topological and Euclidean).

(8) The ability to recognize transitivity and recognize physical and conceptual equivalence.

b. Logical skills

(1) The ability to perform basic matching tasks, which include matching physical attributes (e.g., colors), abstract attributes (e.g., functions), as well as conceptual matching (e.g., one-dimensional matching with noisy attributes).

(2) The ability to logically group items on the basis of a certain dimension (e.g., simple one-way consistent sorting).

(3) The ability to perform logical operations related to multiple class membership (e.g., group objects using matrix format).

(4) The ability to perform multi-dimensional grouping (e.g., exhaustive sorting).

(5) The ability to perform horizontal and hierarchical reclassification (e.g., class inclusion--combine attributes to form successive classes).

7. Communication Skills. The major goal for including the communication skills area in our curriculum is to help each child acquire the ability to extract and integrate "meaning" from the environment. In other words, this curriculum is concerned with the development of the child's ability to understand and respond to behaviors of others in a more interactive and adaptive fashion and to acquire the capacity to express personal meanings more clearly and efficiently. It is assumed that the communication skills are acquired simultaneously and interactively along with other aspects of cognitive growth. As the specific words to give labels to objects and events in the physical and psychosocial world are learned, the child also learns to recognize differences and commonalities in the variety of attributes; hence, competency in communicating with and understanding others is increased.

According to Vygotsky (1962), the conditions which influence the development of speech (overt language) are also related to the development of verbal mediation (covert language). That is, as one acquires the verbal labels, one is required to use selective attentional skills (i.e., inhibition of irrelevant aspects of the learning environment); and as one

acquires an increasing number of labels (i.e., speaking vocabulary), one also develops such cognitive skills as the ability to shift from using words exclusively as labels with single referents to the use of words that have multiple referents. Furthermore, in learning multiple meanings of words, the child must make both generalizations and discriminations. Therefore, as the child uses these words in the social contexts, (s)he also uses certain logical skills to gradually develop the ability to adjust his/her speech to fit the communication process (the ability to select the specific connection between words and referents which include such logical skills as the ability to hypothesize and to generalize a word from one setting to another).

It is further assumed that differences found in young children's ability to communicate are more than just differences in such linguistic qualities as syntactic structure, vocabulary, and intelligibility. The differences in communication skills are strongly influenced by the habitual patterns of verbal behavior of the child in the context of a particular cultural milieu, and by such cognitive factors as the child's ability to take the listener's role, the ability to make appropriate responses to the speaker, and the ability to make appropriate feedback responses to the speaker if additional information is needed to respond.

Communication skills included in the curriculum are basic skills identified and related to the development of the young child's functional use of language. They deal with such communication abilities as requesting help, asking questions, using verbal persuasion, debating, verbal negotiation, seeking and giving information, expressing opinions, feelings, and thoughts to others, as well as giving and following verbal instructions and directions. These communication abilities are competencies, which if not specifically developed, can cause serious deficits in the child's symbolic thinking and communication abilities in general, and in the abilities to function in his/her school and extra-school

environment in particular (Wang, 1973c). Therefore, the goal of the communication skills component is to develop effective speakers as well as active listeners.

Objectives included in the communication skills component are concerned with the development of:

a. The ability to comprehend verbal messages--which includes verbal labeling of physical attributes (e.g., color and size), and abstract attributes (e.g., functions and effects)--and the development of listening and attending skills.

b. The ability to use language to communicate to others in the following areas:
   (1) Describe attribute differences and similarities.
   (2) Describe rationale and concept.
   (3) Describe cause and effect.
   (4) Ask questions (self).
   (5) Ask questions (others).
   (6) Verbalize rules.
   (7) Describe logical deductions.
   (8) Express feelings, thoughts, and needs.
   (9) Give information as requested.

c. The ability to follow and give simple directions as well as directions with multiple (3) commands.

d. The ability to use verbal mediation and solve conceptual problems.

e. The ability to use words with multiple referents.

f. The ability to use different words to describe the same object, event, class, environment, etc.

8. Independent Learning Skills. The ability to function independently (the development of autonomy) is considered a developmental characteristic of increasing cognitive maturity of the growing child (Erikson, 1963; Maslow, 1962; Piaget, 1965). The quality of independence is generally described in terms of the child's ability to solve problems and carry out responsibilities placed upon him/her by the immediate home environment, and expectations held by the broader cultural and societal environment. In school situations, independence is generally referred to as the child's ability to function and learn with increasing autonomy and self-control.

The aim of the independent learning skills component is to develop the child's ability to take responsibility for planning and exerting increasing control over the learning resources and the learning environment (e.g., the ability to make choices and decisions with respect to the nature of the learning activities pursued, as well as the time, place, and manner in which the activities are carried out), and the ability to communicate learning needs to others and actively seek help if needed (Wang, 1973b).

Four major categories of behaviors have been identified for inclusion in the independent learning skills area:

a. The child's ability to carry out preschool tasks with minimum assistance from the teacher. This includes the development of the abilities to:
   (1) Attend to the task instructions.
   (2) Carry out the task according to instructions.
   (3) Request help (from the teacher or another student) when needed.
   (4) Persist until one task is completed before moving to another task.
   (5) Evaluate task performance.

b. The child's ability to structure personal learning plans with minimum assistance from the teacher.

(1) Decide which task(s) (s)he wants to accomplish for the school day.

(2) Decide the specific time during the school day in which (s)he plans to carry out each particular task.

(3) Make increasingly greater long-range learning plans (for several days, a week, and/or longer).

c. The child's ability to carry out the learning plans (s)he has structured with minimum assistance from the teacher.

(1) Get the materials needed to perform the task(s).

(2) Find the work space needed.

(3) Wait for a turn to use materials and spaces if they are not available, and make alternative plans to adapt to the limits set by the situation.

(4) Perform the task.

(5) Request help (from the teacher or another student) when needed.

(6) Follow specific rules and directions in using a particular piece of equipment and/or materials.

(7) Fulfill task appropriate materials management responsibilities.

(8) Persist until one task is completed before moving to another; revise plans if necessary.

d. The child's ability to evaluate his/her own work.

(1) Evaluate each step of the work according to plans and revise the plans if necessary.

(2) Evaluate outcomes of the work in terms of the goals and commitments the child has made in his/her learning plans.

III. Plans for Future Work in the Development of the Curriculum Components

Now that we have initially identified the criterion objectives of the curriculum, we must perform detailed analysis of the specific competencies that are components and prerequisites to each of the identified criterion behaviors. The techniques we plan to use are similar to the task analysis techniques developed by Gagné (1968), and particularly the technique used by Resnick (1967) in the development of an early learning curriculum. The strategy we plan to follow is to: (1) work backward from the specified criterion behaviors to identify the prerequisites; and (2) identify sequences of learning tasks that would maximize and correspond with the natural sequences of acquisition, and that would maximize integration and transfer.

The analysis begins with hypothesizing, in as much detail as possible, the actual steps involved in the acquisition of the particular ability. Analysis of this type can be used not only to specify prerequisite and component behaviors of a criterion objective but, also, the results of the analysis can be used to develop the sequence of the curriculum content. A detailed discussion of the methodology of this technique, as used in curriculum development, can be found in several sources (Resnick, 1967; Resnick, Wang, & Kaplan, 1973; Wang, 1973a; Wang, Resnick, & Boozer, 1971). In performing task analyses of the criterion objectives of the curricular components outlined in this paper, wherever applicable, we have drawn upon curricular objectives already developed by other LRDC curricular development projects. The objectives include those developed for beginning math skills (Resnick, Wang, & Kaplan, 1973), perceptual skills (Rosner, 1972), classification and communication skills (Wang, 1973c), and independent learning skills and social skills (Wang, 1973b).

As task analysis of the various curricular components identified for the proposed program are completed, we will begin to develop diagnostic procedures and instruments to assess the presence or absence of these criterion behaviors in children, and develop the curriculum sequence and curricular materials.

In the development of curricular materials, our strategy is: (1) to adopt, whenever possible, available curriculum resources from the related programs developed at LRDC and elsewhere; and (2) to design curriculum activities and materials for the related skills from the various components in an integrated fashion across component boundaries. This approach is uniquely different from approaches to curriculum design of extant preschool programs, and approaches adopted in designing the existing LRDC curricula.

Implicit in our design is the aim to use as few tasks as possible to teach as many skills as possible. In other words, a series of curricular tasks will be designed with sets of related skills imbedded in them. Table 1 illustrates the matrix schema we have designed to achieve this objective. For example, the X's in row 1 indicate that it is conceivable that one single task can be used to teach children the ability to attend selectively, the ability to retrieve information, and the ability to group things according to certain dimensions.

Empirical validation of the curriculum will be carried out as part of the total design for the formative and summative evaluation of the program. Discussion of conceptualization of the evaluation model and a detailed description of the evaluation design will appear in another paper (Wang, 1974). Empirical validation of the curriculum will be accomplished through the application of psychometric validation procedures to both empirical studies and field studies in classroom settings. The

TABLE 1

Illustration of How a Selected Number of Curricular Objectives Included in the Various Components Can Be Grouped Together for Instructional Purposes

Curricular Objectives	Curricular Objectives													
	A Attentional Skills			B Memory Skills			C Choice/Contingency Skills	D Independent Learning Skills	E Social Skills		F Numerical Skills				G Logical Skills	
	A_1	A_2	A_3	B_1	B_2	B_3			E_1	E_2	F_1	F_2	F_3	F_4	G_1	G_2
A. Attentional Skills:																
1. Attend selectively		x			x										x	
2. Shift attention			x			x	x	x						x		x
3. Inhibition of attention	x						x			x	x				x	
B. Memory Skills:																
1. Recognition			x					x	x			x				
2. Retrieving information							x			x	x				x	
3. Invent memory strategy										x	x		x			x
C. Choice/Contingency Skills:					x			x								x
D. Independent Learning Skills:	x			x						x						
E. Social skills:																
1. Understand oneself				x							x		x			x
2. Relate to others		x			x				x						x	
F. Numerical Skills:																
1. Count objects			x	x	x	x							x			
2. Use of numerals				x						x						
3. Comparison of set size	x					x				x						
4. Seriation			x	x												x
G. Logical Skills:																
1. Group on the basis of invariant attribute	x				x		x									
2. State reasons for inclusion or exclusion from the grouping					x					x			x	x		

psychometric validation procedures that have been used in several of our previous studies (Resnick & Wang, 1969; Wang, 1973a; Wang, Resnick, & Boozer, 1971) will be adopted.

In addition to the empirical validation of the curriculum sequences, the ecological validity of the curriculum will be evaluated through three successively more stringent criteria, as suggested by Rohwer (1972): (1) improvement in task performance as a result of training, (2) mastery performance on criterion tasks, and (3) improvement so that performance on transfer tasks is at a higher level of mastery. Included in our evaluation plan is the investigation of the effectiveness of the curriculum in the context of student learning outcomes and the achievement of our program goals.

IV. Summary

In this paper we dealt with the rationale behind the development of the curriculum objectives of a beginning school program that aims to: (1) be adaptive to the learning needs of the individual child, and (2) teach specific learning-to-learn skills that are basic to the effective functioning of the preschool child in school and extra-school environments. This paper should be viewed as one of a series of papers dealing with the components included in the total design for an adaptive beginning school learning environment. Figure 1 (page 14) shows the other components included in the design.

Eight curricular areas have been identified for inclusion in the curriculum for the ABLE program. The skills included in each area are considered as a set of generalizable "learning-to-learn" skills that are central to cognitive and social development of the preschool child; furthermore, they are not content specific. The skills were selected with the objective of providing the preschool child with the opportunity to acquire competencies with which (s)he can: (1) order, classify, and conceptualize

the logical structure of the school and extra-school environments; (2) function effectively and interactively with the environment and others in the environment; and above all, (3) develop the motivation and solid foundation upon which future learning can be built.

The basic premise underlying the curriculum development work is that the young child desires some control over the environment, and mastery of the kind of basic skills outlined in this paper can increase the child's ability and confidence in exerting control over some parts of the immediate environment. It is our belief that motivation for further learning will be the consequence of acquisition of these basic learning-to-learn skills. Because one of the most important abilities (or requirements) for functioning in the technical society of the modern world is continuous learning beyond the years of formal schooling, the potential value of a preschool program that aims to develop basic skills in cognitive and social functioning, as well as skills that can be used in acquiring future learning, is quite evident.

In conclusion, we would like to point out that while our program goals and some of the underlying theoretical and practical premises we have discussed in this paper may be shared by other psychologists and educators, we believe the major differences between the ABLE and other extant programs will lie in our being able to contribute to the body of knowledge which will eliminate the many unknowns about the preschool child, the instructional and learning processes, and the design of preschool learning environments through: (1) a systematic approach designed to integrate practical experiences with theory and research findings toward the development of a school program; (2) the explicitness with which the components of the program and the competencies the program aims to develop are defined; and (3) specification of the nature of the interactions among the components that are considered essential for achieving the program goals.

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